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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/531,047

04/12/2005

Shouichirou Sawa

MAM-061

2630

20374 7590 06/09/2008

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SUITE 1105
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EXAMINER

HAN, KWANG S

ART UNIT

PAPER NUMBER

4132

MAIL DATE

DELIVERY MODE

06/09/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/531,047	Applicant(s) SAWA ET AL.	
	Examiner Kwang Han	Art Unit 4132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>4/12/2005</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukui et al. (WO/2002/21616, as cited in IDS, using US 2004/0043294 for translation and citations) in view of Masatoshi et al. (JP 2003-086243, as cited in IDS, Machine translation).

Regarding claim 1, Fukui et al. is directed towards a rechargeable lithium battery (abstract) comprised of the following:

- negative electrode made by sintering a layer of a mixture of active material particles containing silicon or silicon alloy [abstract],
- a binder on a surface of a conductive metal foil current collector [34],
- a positive electrode [16], and
- a nonaqueous electrolyte [16].

Fukui discloses the use of electrolyte solvents such as carbonate's [41] but is silent towards the nonaqueous electrolyte containing carbon dioxide which is dissolved therein.

Masatoshi teaches the use of dissolved carbon dioxide gas within a nonaqueous electrolyte solution used in a rechargeable battery for the benefit of suppressing battery swelling [abstract].

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Masatoshi's dissolved carbon dioxide gas in Fukui's electrolyte solution for a rechargeable lithium battery to suppress battery swelling.

Regarding claim 2, Fukui teaches the sintering being performed under a non-oxidizing environment [9].

Regarding claim 3, the teachings of Fukui and Masatoshi as discussed above for claim 1 are herein incorporated. Fukui further discloses active material particles that have a tendency to undergo a porosity (volume) increase that advances inside from particle surfaces during charge and discharge [18].

Regarding claims 4-6, Masatoshi teaches an amount of carbon dioxide dissolved in a nonaqueous electrolyte with the range of 0.1 to 5.0% by weight of the nonaqueous electrolyte.

Regarding claim 7, Masatoshi teaches a lithium battery in which the carbon dioxide is contained in an inner space (14, sheath can) of the battery [Abstract].

Regarding claim 8, Fukui teaches an electrolyte which contains a cyclic carbonate [41].

Regarding claim 9, Fukui teaches an electrolyte which contains a mixed solvent of a cyclic carbonate and a chain carbonate [41].

Regarding claim 10-12, Fukui teaches a cyclic carbonate which includes ethylene carbonate and propylene carbonate [41].

Regarding claim 13, Fukui teaches a chain carbonate which includes at least one of dimethyl carbonate, diethyl carbonate, and methyl ethyl carbonate [41].

Regarding claims 14 and 15, Fukui teaches a nonaqueous electrolyte that further contains a fluorine containing compound which is a lithium salt [41].

Regarding claim 16 and 17, Fukui teaches a fluorine containing lithium salt of the type LiXF_y or $\text{LiN}(\text{C}_m\text{F}_{2m+1}\text{SO}_2)(\text{C}_n\text{F}_{2n+1}\text{SO}_2)$ [41] (Examples: LiPF_6 and $\text{LiN}(\text{CF}_3\text{SO}_2)(\text{C}_4\text{F}_9\text{SO}_2)$).

Regarding claim 18, Fukui teaches an active material particle with the most preferable mean particle diameters of $10\mu\text{m}$ or below [27].

Regarding claim 19, Fukui teaches a current collector which has an arithmetic mean surface roughness R_a , of at least $0.2\mu\text{m}$ [18].

Regarding claims 20 and 21, Fukui teaches a current collector which comprises an electrolytic copper foil, an electrolytic copper alloy foil, or a metal foil having an electrolytic copper or copper alloy surface layer [22].

Regarding claim 22 and 23, Fukui teaches a binder which remains even after a heat treatment for sintering and comprised of polyimide [35].

Regarding claim 24, Fukui teaches active material particles composed of silicon [26].

Regarding claim 25, Fukui teaches an electric conductor which is mixed in the mixture layer [57].

Regarding claim 26, Fukui teaches a method for fabricating a rechargeable lithium battery comprising the step of:

- providing a layer of a mixture of active material particles containing silicon and/or a silicon alloy [9],
- a binder on a surface of a conductive metal foil as a current collector [9],
- sintering the mixture layer while being place on the surface of the conductive metal foil to prepare the negative electrode [9], and
- assembling the battery using the negative electrode, positive electrode, and nonaqueous electrolyte [16].

Fukui discloses the use of electrolyte solvents such as carbonate's [41] but is silent towards the nonaqueous electrolyte containing carbon dioxide which is dissolved therein.

Masatoshi teaches the use of dissolved carbon dioxide gas within a nonaqueous electrolyte solution used in a rechargeable battery for the benefit of suppressing battery swelling [abstract].

It would have been obvious to one of ordinary skill in the art at the time of the invention to apply Masatoshi's dissolved carbon dioxide gas in Fukui's electrolyte solution for a rechargeable lithium battery to suppress battery swelling.

Regarding claim 27, Fukui teaches the sintering being performed under a non-oxidizing environment [9].

Regarding claim 28, Masatoshi teaches a step of dissolving carbon dioxide in the nonaqueous electrolyte include a step of blowing (Abstract, "injecting") gaseous carbon dioxide into the nonaqueous electrolyte.

5. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukui et al. and Masatoshi et al. as applied to claim 26 above, and further in view of Lee et al. (US 2004/0213985).

The teachings of Fukui and Masatoshi as discussed above are herein incorporated. Both Fukui and Masatoshi are silent to the use of a carbon dioxide atmosphere during the assembly of a rechargeable lithium battery.

Lee teaches the use of a carbon dioxide atmosphere including a step during the assembly of a separator for a rechargeable lithium ion battery [006] for the benefit of ionizing and irradiating to modify a surface [31].

It would have been obvious to one of ordinary skill in the art at the time of the invention to include Lee's step of using a carbon dioxide atmosphere in Fukui and

Art Unit: 4132

Masatoshi's battery for the benefit of providing means to modify the materials used in the battery's assembly.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./

Examiner, Art Unit 4132

Application/Control Number: 10/531,047

Page 8

Art Unit: 4132

/Jessica L. Ward/

Supervisory Patent Examiner, Art Unit 4132